



Tectonics, orbital forcing, global climate change, and human evolution in Africa: Introduction to the African paleoclimate special volume

Author(s): Maslin MA, Christensen B
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Abstract:

The late Cenozoic climate of Africa is a critical component for understanding human evolution. African climate is controlled by major tectonic changes, global climate transitions, and local variations in orbital forcing. We introduce the special African Paleoclimate Issue of the Journal of Human Evolution by providing a background for and synthesis of the latest work relating to the environmental context for human evolution. Records presented in this special issue suggest that the regional tectonics, appearance of C(4) plants in East Africa, and late Cenozoic global cooling combined to produce a long-term drying trend in East Africa. Of particular importance is the uplift associated with the East African Rift Valley formation, which altered wind flow patterns from a more zonal to more meridional direction. Results in this volume suggest a marked difference in the climate history of southern and eastern Africa, though both are clearly influenced by the major global climate thresholds crossed in the last 3 million years. Papers in this volume present lake, speleothem, and marine paleoclimate records showing that the East African long-term drying trend is punctuated by episodes of short, alternating periods of extreme wetness and aridity. These periods of extreme climate variability are characterized by the precession-forced appearance and disappearance of large, deep lakes in the East African Rift Valley and paralleled by low and high wind-driven dust loads reaching the adjacent ocean basins. Dating of these records show that over the last 3 million years such periods only occur at the times of major global climatic transitions, such as the intensification of Northern Hemisphere Glaciation (2.7-2.5 Ma), intensification of the Walker Circulation (1.9-1.7 Ma), and the Mid-Pleistocene Revolution (1-0.7 Ma). Authors in this volume suggest this onset occurs as high latitude forcing in both Hemispheres compresses the Intertropical Convergence Zone so that East Africa becomes locally sensitive to precessional forcing, resulting in rapid shifts from wet to dry conditions. These periods of extreme climate variability may have provided a catalyst for evolutionary change and driven key speciation and dispersal events amongst mammals and hominins in Africa. In particular, hominin species seem to differentially originate and go extinct during periods of extreme climate variability. Results presented in this volume may represent the basis of a new theory of early human evolution in Africa.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Ecosystem Changes, Extreme Weather Event, Human Conflict/Displacement, Precipitation, Sea Level Rise, Temperature, Other Exposure

Climate Change and Human Health Literature Portal

Extreme Weather Event: Drought

Temperature: Fluctuations

Other Exposure: ocean salinity; glaciation

Geographic Feature: 

resource focuses on specific type of geography

General Geographical Feature

Geographic Location: 

resource focuses on specific location

Non-United States

Non-United States: Africa

African Region/Country: African Region

Other African Region: East Africa; South Africa

Health Impact: 

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Resource Type: 

format or standard characteristic of resource

Research Article, Review

Resilience: 

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: 

time period studied

Historical